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Ring Shape Micro-strip Patch Antenna for UWB applications

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Abstract : *In this paper, ring microstrip patch antenna structures with 3 different DGS Structure. Antennas have been analyzed, investigated and optimized by CST MW studio tool. Proposed designs are based on the concept Defected Ground Structure while its overall dimensions are kept constant. The objective is to design UWB antenna within the range of 3-15GHz. The presented antennas are simulated on cheaper and lossy FR-4 substrate, and their parameters are measured and compared. In this,maximum VSWR value of less than 1.5 has been achieved. At the end a, good agreement has been obtained between simulated and measured parameters.*

Keywords – Micro-strip Antenna, Ultra-wide Band, Defected Ground Structure.

1. Introduction

Micro-strip patch antennas have been widely used in many systems because of their different features such as compact size, low profile, light weight and ease of fabrication. Various shapes of the patches were proposed for these antennas, such as circular, square, triangular, elliptical, etc. Many applications are there which exist between the UWB frequency bands. One major problem for UWB systems are electromagnetic interference (EMI) from existing frequency bands, because there are so many other wireless narrowband application that are allocated for different frequencies band in the UWB band.

The demand of today's antenna is the portability with high performance therefore it is important for the designer to design the UWB antenna they can reflect the interference from the other existing bands. There are several ways to improve the performance of the antenna one such technique is DGS. The DGS structure provides the main improvement technique by introducing the imperfection onto the ground plane which changes the inductive and capacitive property resulting in multiple resonant frequency allowing multi-band operation. Recently many types of UWB antennas having the wide bandwidth and band notch characteristics have been developed for UWB applications.

The easiest and most common method to achieve a band notch is making a slot of different shapes into the Ground structure of the antenna, will affect the current flow in the patch. Here Different type of shapes is used to make the slots (i.e., L-shape, U-shape, H-shape) are used to get the band-notched in the desired frequency band. In this paper compact UWB antenna designs are proposed. This proposed antenna structure's simulation is carried out using the Computer Simulation Technology Simulator (CST) studio tool, one commercial 3- D full-wave electromagnetic simulation software.

2. Antenna Design

The different DGS structures that can be implemented in the proposed design are shown in L-shaped, U-shaped, H-shaped.

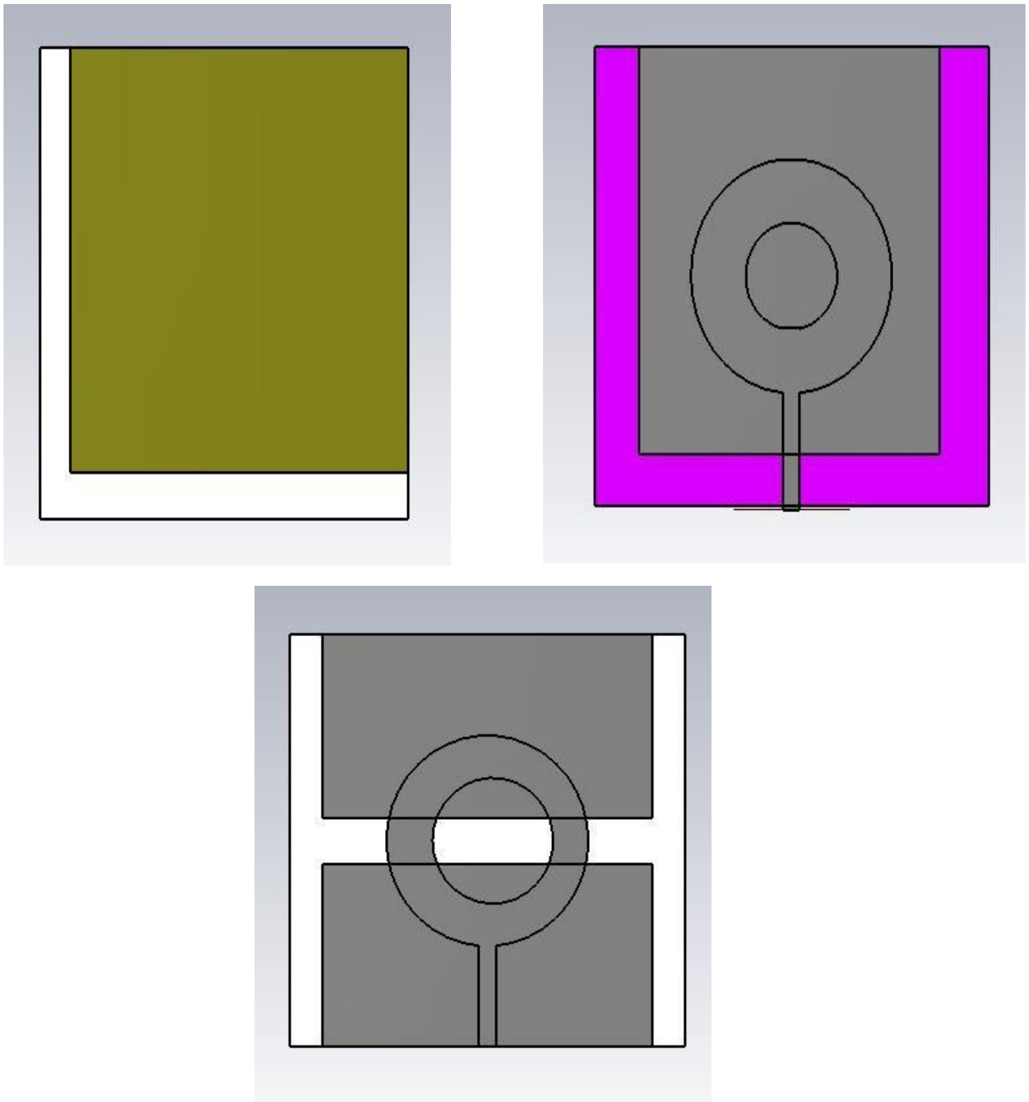

Fig.1 L-shape, U-shape, H-shape

Parameter of the proposed antenna are listed in below table.

Table Dimension of the antenna

Parameter	**Description**	**Value(mm)**
wg	Ground width	20
lg	Ground length	20
hg	Ground height	0.035

hs	Substrate length	0.794
pr	Patch radius	10
wef	Width of feed	1.53
lef	Length of feed	20

The ground plane and patch of the antenna is designed on copper material. The proposed antenna isdesigned on FR-4 substrate with εr =4.4.

3. Simulation result

The s11 vs frequency curve with the optimized values is shown below. This shows that the proposedantenna covers the entire UWB

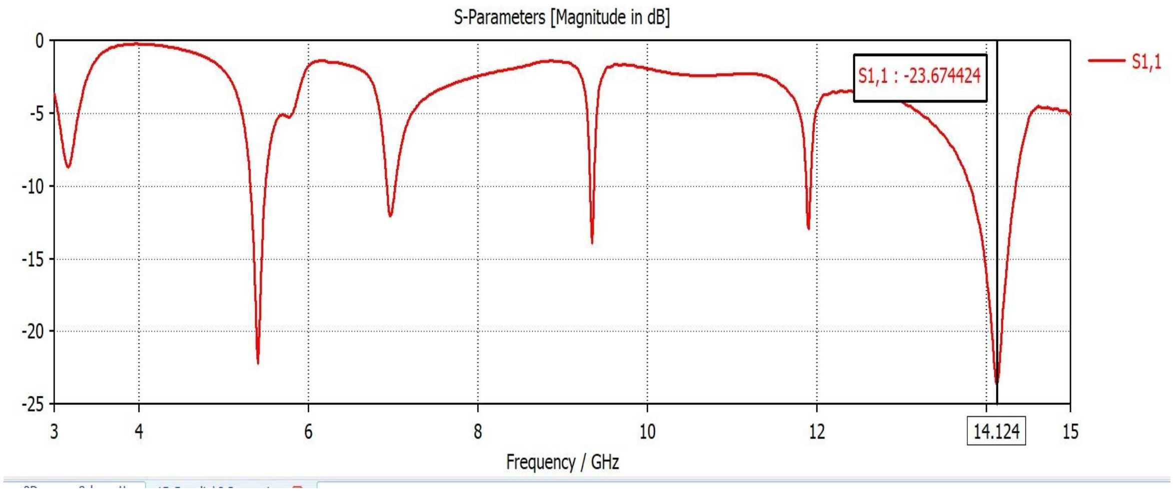

Fig.2 Return Loss vs Frequency of proposed Antenna

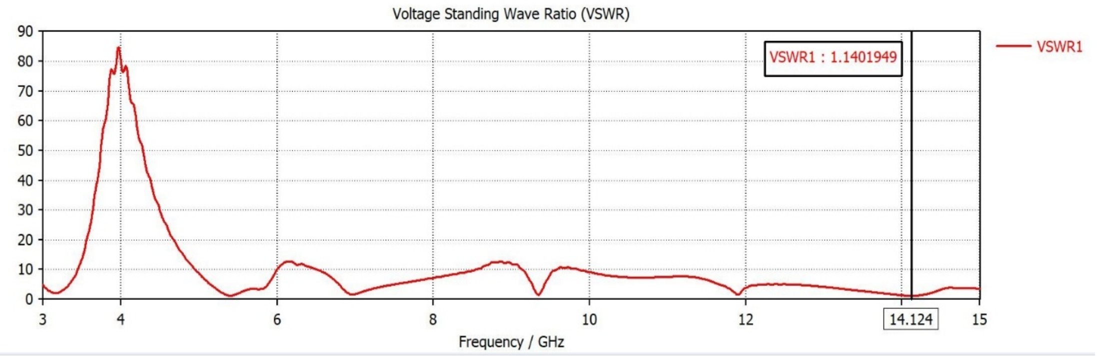

Fig.3 VSWR

The voltage standing wave ratio and return loss is 1.31 and -17db at resonant frequency 5.36GHz.

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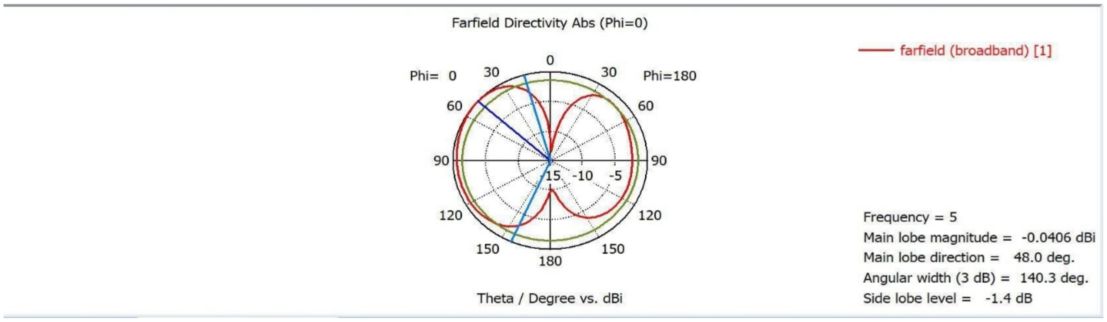

Fig.4 Farfield Directivity at Phi=0

4. Conclusion

The main aim of this paper micro strip patch antenna design that would give an ultra- wideband, multiple resonant frequencies and a good gain as well. The requirements for ultra-wideband capability was accomplished as can be seen from the results with the proposed antenna having bandwidth of about 15GHz. The requirements for multi-band operation was also satisfied as the proposed design gives three resonant frequencies at 9.3, 11.9 and 14.12GHz.

References

[1] A Novel Elliptical Ring Microstrip Patch Antenna for Ultra-Wideband Applications. Manisha Gupta,Kevin KiprutoMutai,Vinita Mathur,Deepak Bhatnagar,Springer Science+Business Media, LLC, part of Springer Nature 2020.
[2] Xiao Zhang,and Lei Zhu,“Gain-Enhanced Patch Antennas with Loading of Shorting Pins" IEEE Transactions on Antennas and Propagation 0018-926X (c) 2016 IEEE.
[3] Denlinger, E.J., “Radiation from Microstrip Radiators” IEEE Transactions on microwave Theory and techniques, April1969,vol.17, No. 4, pp. 235-236
[4] Yu, D., Gong, S. X., Xu, Y., & Wan, Y. T. (2015). Dual-band dual-polarized circular microstrip patch antenna with thecurved slots on the ground. Progress in Electromagnetics Research Letters, 51, 27-31
[5] Barret, R. M., “Microwave printed Circuits-a historical survey,” IEEE Transactions on microwave Theory and techniques,vol.3, No.2, pp. 1-9
[6] Gupta, M., & Mathur, V. (2018). Multiband multiple elliptical microstrip patch antenna with circular polarization. WirelessPersonal Communications, 102, 355–368.
[7] Zi-Bin Weng , Nai-Biao Wang ; Yong-Chang Jiao, Study on High Gain Patch Antenna with Metamaterial Cover Antennas,Propagation & EM Theory, 2006. ISAPE '06. 7th International Symposium, 26-29 Oct. 2006 Guilin.
[8] M. Jadhav, ankit pancholi, dr. A. M. Sapkal,,„Analysis and implementation of soft decision decoding algorithm of ldpc‟‟, pune university phase-i, d,-402, g.v 7, ambegaon, pune (india),[IJETT],2013.
[9] Kuzu, S., & Akcam, N. (2016). Array antenna using defected ground structure with fractal form generated by Apolloniuscircle. IEEE Antennas and Wireless Propagation Letters, 16, 1020–1023.
[10] Denlinger, E.J., “Radiation from Microstrip Radiators” IEEE Transactions on microwave Theory and techniques, April1969,vol.17, No. 4, pp. 235-236.
[11] Mak, K. M., Lai, H. W., Luk, K. M., & Ho, K. L. (2017). Polarization reconfigurable circular patch antenna with C-shape IEEE Transactions on Antennas and Propagation, 65(3), 1388–1392
[12] Devendra Pratap, Satyendra Sharma; 'Planning and Modelling of Indoor WLAN Through Field Measurement at 2.437 GHz Frequency',Volume No.2,Issue No.2,2014,PP.015-019,ISSN :2229-5828
[13] Verma, Garima; 'Agile Software Development : An Alternative Approach to Software Development',Volume No.2,Issue No.2,2014,PP.020-023,ISSN :2229-5828
[14] H.S. Pali, N.kumar; 'Biodiesal Production from Sal (Shorea Robusta) Seed Oil',Volume No.2,Issue No.2,2014,PP.024-029,ISSN :2229-5828
[15] Maneesh Kumar , Rajdev Tiwari, Rajeev; 'Automated Test Case Genration on the Basis of Branch Coverage Using Teaching Learning Based Optimization',Volume No.2,Issue No.2,2014,PP.030-036,ISSN :2229-5828

[16] Meenakshi Saini,Nitin Kathuria, V.K.Pandey; 'L Slot Circularly Polarized Broadband Antenna',Volume No.2,Issue No.2,2014,PP.037-041,ISSN :2229-5828

[17] Patro, B.Narasingh; 'Content Based Image Retrival Thro-ugh Features Like Color ,Texture and Shape',Volume No.2,Issue No.2,2014,PP.042-046,ISSN :2229-5828

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